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USE OF WATERBIRDS AS BIO-INDICATOR OF WATERS STATE IN LAKE OF REGHAIA (ALGERIA)

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ABSTRACT

During period of 2008 / 2009, census of aquatic birds performed in Algerian humid zone (Lake of Reghaia), reveals a total specific richness of 51 species for year 2008 and 39 other for the second year (2009). Results show that the prospected humid zone is of a large international importance for welcome and conservation of waterbirds overwintering in western Palaearctic. Algeria enrolled 47 sites on RAMSAR list having an international importance among them the natural reserve of Reghaia Lake classed on 4th of June 2003 and which is becoming affirmed more and more as humid zone model of Mediterranean south (Atlas IV of Algerian humid zones of international importance 2004) Physico-chemical characteristics study of lake's waters during years (2008/2009) allows us to explain more efficiently some phenomena which are occurring in biology, evolution and fluctuations of waterbirds number. To valuate influence of abiotical factors on distribution of bird's species, a multivariate analysis has been used. This study shows the highest correlation between fluctuation of waterbirds number with various parameters. (Temperature, salinity, aquatic plants transparency and other disturbances). This study has confirmed the impact of water physic-chemical characters on waterbirds populations.

KEYWORDS: Birds, Aquatic, Environmental Parameters, Humid Zone, Lake of Reghaia, Algeria

INTRODUCTION

Biodiversity of western Mediterranean in general and particularly in Algeria is very varied because of its geographic position, of its potential in humid zones with high ecological, cultural and economic values and so with large variety of these habitats (QUEZEL and MEDAIL, 2003) Mediterranean humid zones constitute fragile and diversified multifunctional areas. Humid zones constitute sites of national and international importance for breeding, wintering and pre and postnuptial migrations of waterbirds (WHITTAKER and LIKENS, 1973; GIBBS, 1993). We are knowing strategic importance of North Africa in migrations system of avifauna. North of Africa is as a sort of watch which allows to birds to find a refuge in autumn, after having crossed Mediterranean sea; then in Spring, also after the desert crossing (BLONDEL, 1979).

In order to safeguard this ornithological diversity and facing to intensive exploitation of humid zones, it is crucial to know diversity and abundance of species (HAIG and al, 1998). Yes, waterbirds are the good ecological indicators of their environments (GUILLEMAIN and al, 2000). They answer quickly to disturbances by decrease of their abundances, and even disappearance of some species (GREEN, 1996). In this study, we are looking into characterizing Algerian humid zone by consideration of spatial and seasonal variability of aquatic bird's populations; identifying environmental parameters determining distribution and variation of indicator birds' species of quality of our study environment

MATERIALS AND METHODS

The Marsh of Reghaia is selected as study station because it is considered as site of international importance It constitutes the last vestige of inland water body of ancient Mitidja It is the only humid zone of Algiers' bio-geographic region which directly facing Mediterranean Sea allowing so to play a role of stopover for migratory birds after crossing of Mediterranean Sea The Lake of Reghaia is situated between latitudes 36°45' and 36°48' North and longitudes 03°19' and 03°21' East It is a part of plain's Mitidja, far of 30 km at East of Algiers. It is situated on the South of Mediterranean Sea and at less than 10 m altitude. It is the last humid zone of Mitidja's plain which spreads on an area of about 842 hectares representing the Lake. Its position is between a maquis on the East of agricultural grounds on the West and ribbon of dunes on the North (Figure 1).

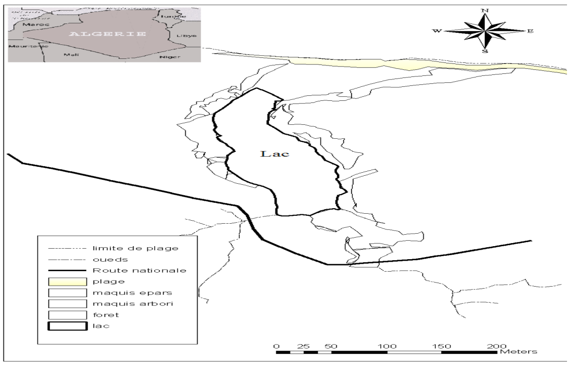

Figure 1: Geographical Location of the Lake of Réghaia

Climatologic analysis shows that study region belongs to bioclimatic sub-humid stage characterized by dry and hot summers and by mild and wet winters. To perform this study, we have set several goals where the most important is to realise an inventory of waterbirds which can be the most comprehensive possible, It is also question to understand structuring and patio-temporal evolution of waterbirds and to highlight physico-chemical factors of water likely to influence distribution of these last ones. Water samplings have been made with a seasonal pace during 2 years (2008/2009).

Choice of sites and frequency of samplings depend on large part of morphology and hydrodynamic characteristics of inland water body. For a best appreciation of water composition's variations, we have realised twelve sampling campaigns by reversal bottle of Niskin type

A minimum interval of 03 weeks is respected between each sampling in order to cover correctly the whole of the vegetation period. Some parameters have been measured in situ: temperature, potential hydrogen, dissolved oxygen, salinity, electric conductivity with help of a multi parameter analyser of ground, and so transparency measured by Secchi disc. On the other hand, other parameters are measured in animal ecology laboratory (FSB-USTHB). Parameters are: MES and bicarbonates (by filtration method), calcium, magnesium, and sulphate (by gravimetric method), chlorides, (volumetric method), phosphates, and nitrogen compounds (by metrical colour). Water on surface was collected by hand with help of plastic bottles containing one litre and half (1.5 L). Each sampling is followed of an information sheet on which it is mentioned: date, sampling hour and climatic conditions. For counting of waterbirds at level of our study site, we proceed to individual counting by absolute method, because il is considered that population is valuated directly in its absolute value and all individuals are counted. The goal of our counting is to valuate population of our species. Counting is realised in the

morning, we move in car by driving slowly. Itinerary is generally covering a distance in less than three hours during the day without neither fog, nor pelting rain (BREDIN 1983).

RESULTS AND DISCUSSIONS

Specific Composition of Water Birds Population in Lake of Reghaia

In 2008, in relative abundance terms, dominant species according seasons, are by order of decreasing importance (Table 1): In winter, the Yellow Legged Gull (*Larus michahellis)* is of (29.64%), the Northern Shoveler (*Anas clypeata*) (21.88%) and the Black Headed Gull (*Larus ridibundus)* (16.96%). In Spring Common Coot with (*Fulica atra)* (30.58 %),the Mallard duck (*Anas platyrhynchos)* (30.58 %),the water hen with (*Gallinula chloropus*) (12.01%). In summer, Common Coot (*Fulica atra*) takes the first rank in autumn with (47.7%).

It is noted that during winter, population is of (21164) and in autumn (9479). Lake of Reghaia hosts a big number of waterbirds. The Marsh of Reghaia is a wintering environment for migratory birds. Numbers and centesimal frequencies of birds inventoried in Reghaia Lake in 2009, are recorded in (Table 2).

In 2009, the Northern Shoveler (*Anas clypeata*) dominates in winter with (22.74%). In spring it is Common coot (*Fulica atra)* which occupies the first rank with (29.56%) and in summer we have Black Legged Gull (*Larus ridibundus*) with (43.65%). In Autumn, Calamon occupies the first place (*Porphyrio porphyrio)* with (36 .94 %). It is noted that number of individuals counted during year 2008 and 2009 varies from season to another. Yes, individuals' populations are important in winter coinciding with arrival of wintering birds. In spring these wintering birds reach their bird nesting sites and letting place to sedentary birds

The number of individuals increases again in spring, with arrival of summer period's birds. In autumn, number of birds becomes enough important because wintering birds begin to arrive. In 2009, counting of waterbirds, shows that it is always Anatidae and Rallidae which dominate This observation is consistent with the one of (MERIEM, 1985). in the same study region, mentioning that among wintering birds the most observed is the Common coot (*Fulica atra)* with 25.5% followed by Northern Shoveler (*Anas clypeata*) (19.2%) and Mallard Duck (*Anas platyrhynchos)* (12.8%). In winter; population of birds in wet zones of Sahel at Burkina Faso, is characterized by abundance of ducks (43%). Our results show decrease of 45% of the total population's density. According to (JACOBSON, 1996), availability and accessibility of food resources are among the main factors determining distribution of aquatic birds.

Abiotic Environmental Parameters

At level of Marsh of Reghaia, between 2008 and 2009; average temperatures, minimal of 15.4°c and maximal of 29.2°c are respectfully reached in January and August. Temperatures present a remarkable seasonal gradient; in other respect, we have noted absence of a real thermal stratification by the weak depth of the water body.

Temperature is a very important parameter in any aquatic ecosystem, because all physical constants are under its dependence (BONTOUX, 1993). Likewise it checks the whole of metallic phenomena and conditions thus, distribution of totality of species and living creature's communities in the biosphere (RAMADE.2003). Salinity measures have allowed revealing seasonal average values passing from 0.3‰ in winter to 0.9 ‰ in summer. These high values correspond exactly to maximal temperatures of water. According to GUILLYARDI (2001), salinity is modified by dilution's phenomenon – concentration linked to flows of freshwater resulting from record between precipitations and evaporation.

As for average values of transparency, they are variable between 1.2 to 0.5m. Transparency of water varies with regular manner and depends on hydrological manifestations and on development of algal biomasses (EL GHACHTOUL and al, 2005). As a general rule, water of Reghaia Lake presents a weak transparency. Dissolved oxygen normally provides 35% of gas volume dissolved in the water. This concentration is in accordance of several factors, essentially the temperature (CHAMPIAT and LARPENT, 1988). Concerning this present study, dissolved oxygen presents widest variations, average contents pass from good situation to excellent one, during winter (9.52%) to a very critical situation in summer period (2.5%)

Table 1: Results of Physicochemical Variables

	Mg2+	Ca2 +	Tran	PO4	NO2	NO3	Cl-	Sal	O2 d	MES	Cond	p H	T
WI 8	138	174	0.5	2,39	1,8	1,4	646	0.3	8.53	29.6	1039	7.2	16.2
SP8	56	87.3	0.2	5.4	0.01	1,2	341	0.7	0.07	38.32	1200	8.3	20.6
SU8	66	35.4	0.7	6.01	0.13	0.04	320	0.9	0.7	220	2212	9.1	29.9
AU8	136	176	1.3	4.5	1.5	2.23	35,5	0.4	10.45	44.68	2011	7.6	15.1
WI9	110	110	0.4	3.68	0.2	0.2	420,3	0.7	8.9	50	1720	7.5	17
SP9	132	78	0.5	4.24	0.15	0.1	298	0.8	0.1	48.5	1815	8.2	24
SU9	120	80.3	0.3	3.52	0.4	0.08	360	0.9	4.3	30	1829	8.4 5	28.5
AU9	113	75.6	0.1	1.75	1.3	0.7	504	0.4	8.6	82	1688	7.7	15.7

WI 8: Winter 2008; SP8: Spring 2008; ET8: Summer 2008; Aut 8: Autumn 2008

WI 9: Winter 2009; SP8: Spring 2009; ET8: Summer 2009; Aut 8: Autumn 2009

As for nutritious items, we have noted that nitrogen and phosphorus contents are generally large (Table 1). These two items cause acceleration of eutrophication' phenomenon which marks an advanced stage in our site. According to (Ronka et al 2005), eutrophication which can have a positive impact on aquatic birds populations by increasing primary and secondary productivity, thus in increasing food resources for birds. This same author notes a negative correlation between eutrophication and the number of couples of some aquatic bird's species, notably the common coot According to (Ronka and al 2005), it seems that relation between eutrophication level and aquatic bird's population could be complex and not linear.

Yes (Suter, 1994) notes that interest of a lake for several aquatic birds species are positively correlated with their eutrophication level until eutrophic stage. After, correlation would become negative for several species, as dabbling duck and pochards (*Aythya ferina)* (Suter,1994).

Water Birds Relation and Environmental Parameters

Our results show a decreasing of 45% of total density of waterbirds' population. According to (JACOBSON, 1996), availability and accessibility of food resources, are among the main factors determining distribution of aquatic birds. Ornithological studies performed in our study region (LEDANT and al 1979;MERIEM, 1985), shows that abundance and availability of trophic resources and so disturbance are direct determining factors of density of these populations. Indeed, quasi-total and precocious degenerescence. of aquatic vegetation cover of potamogeton is a consequence of incessant increasing of salinity and of massive and precocious arrival of Common coot's populations. For example, daily quantity of potamogeton ingested by individual of Common cool in normal conditions is of 104 g of MS (HAMDI and al 2012) in National Park of ICHKEUL in Tunisia, has estimated that 30.000 common coots present each year in September would be thus able to consume more than 90 tons of MS/month, quantity obviously not available in

duration on the site. This alarming nutrient situation of herbivorous birds can in major part, justify massive departure of herbivorous birds contingents.

Concerning fluctuations of population's number, our results highlighted, role of different physico-chemical parameters such as (temperatures, salinity, transparency and other variables). Those last ones are all the same adapted to rapid alert, since they are directly linked to some processes such as pollution by toxic substances; change of hydrologic diets or of eutrophication.

To view more easily influence of environmental parameters on distribution of the Lake's waterbirds, Principal Component's Analyses have been made. In our analysis, we have maintained 13 parameters; PCA is performed on centred and focused data compared to their average and difference-type. Use of normalised data allows to free oneself from measure units which are heterogeneous in our case.

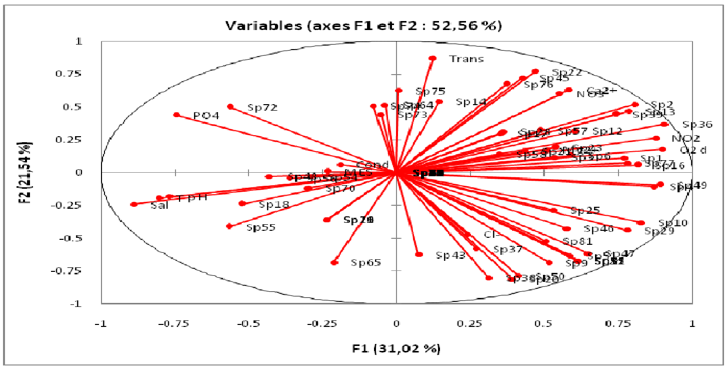

Figure 2: Results of Principal Component Analysis (PCA) for 1 3 Environmental Parameters

The correlation matrix (figure 2) let appear distribution of physico-chemical parameters on two factors (F.1 and F2). Variables coordinates on axes are correlation coefficients between variables and factors. After logarithmic transformation of variances, the first and second axes of PCA (for the 13 environmental parameters) have represented respectively 31.02% and 21.54% of the total variance (Figure 2).

PCA analysis shows significantly, correlation between physico-chemical variables (temperature, salinity, transparency, phosphor, nitrogen and other variables). and spatio temporal distribution of waterbirds of this Lake. In national or regional scale, population tendencies of birds can show with general manner an increasing or loss of suitable habitats (GREEN Y FIGUEROLA, 2003). In scales more local, physico-chemical parameters of environments, notably salinity, the PH, trophic level, influences choice of the diet's sites, of rest and of reproduction for numerous aquatic birds species, which could be indicators of these characteristics of environment (GREEN Y FIGUEROLA, 2003; KUSHLAN ,1993).

CONCLUSIONS

The Marsh of Reghaia is selected as study station because it is considered as site of international importance. It constitutes the last vestige of water body of ancient Mitidja. It is the only humid zone of bio-geographic region of Algiers facing directly the Mediterranean Sea allowing thus playing a role of stopover for migratory birds after having crossed Mediterranean Sea. At level of Reghaia Marsh, between 2008 and 2009, minimum average temperatures of 15.4°c and maximal of 29.2°c are respectfully reached on January and August. Temperatures present a seasonal gradient.

Measurements of salinity have allowed revealing seasonal average values which pass from 0.3‰ in winter to 0.9‰ in summer. As for average values of transparency they are variable between 1.2 to 0.5m. As a general rule, water of Reghaia Lake presents a weak transparency. Concerning the present study, dissolved oxygen, presents very large variations, average contents pass from good situation to excellent one during winter (9.52%) to a very critical situation in summer period. As for nutritious items we have noted that contents in nitrogen and phosphor are generally large, these two items occur acceleration of eutrophication phenomena which marks an advanced stage in our site. It seems that relations between eutrophication level and aquatic birds populations could be complex and non linear. Our results show a decreasing of 45% of the total density of waterbird's population. Thus quasi-total and precocious degenerescence of aquatic vegetation covers of potamogeton is consequence of incessant rising of salinity and the massive and precocious coming of common coot's population. Concerning fluctuations of population numbers, our results have highlighted, role of different physico-chemical parameters such as (temperatures, salinity, transparency and other varieties).

These last ones are all the same adapted to a rapid alert, since they are directly linked to some processes such as pollution by toxic substances, change of hydrologic or eutrophication diet. To view more easily influence of environmental parameters on distribution of waterbirds of the Lake, analyses in principal components have been performed (for 13 environmental parameters) have respectfully represented (31.2%) and 21, 54 % of total variance. Populating structure at any given moment, that it means its composition, its distribution and importance of different present species, translate various interactions which exert between, species themselves and so between species and surrounding environment. This study shows that Reghaia Lake keeps a strong heterogeneity both spatially and temporally. It may be subject of important changes following years.

Analysis of PCA, shows significantly, correlation between physico-chemical variables (temperature, salinity, transparency, phosphor, nitrogen and other variables) and spatio-temporal distribution of waterbirds of this Lake. These environments which are considered as “ordinary” at biological level, are less well known and thus still more threatened. Their damage is often passed unnoticed although they play the same functional roles of hydrology, of habitats, etc.

Knowledge of these humid zones cannot be considered only after study of global functioning of these last ones and their use by waterbirds which are the real functioning descriptors of an environment. Our study has highlighted that populating structure for a given moment, that it means its composition, its distribution and importance of different present species, translate various interactions which exert between species themselves and so between species and surrounding environment. This study shows that Reghaia Lake possesses a strong heterogeneity, being spatially and temporally. It may be subject of change in the following years.

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Table 2: Diversity, Abundance of Water Bird in the Lake of Réghaia in 2008

	2008							
Species	**win**	**%**	**spr**	**%**	**sum**	**%**	**aut**	**%**
Anas platyrhynchos	518	2.45	189	13.76	195	10.9	491	5.18
Anas clypeata	4630	21.88	19	1.38	22	1.24	4522	47.7
Anas strepera	61	0.29	0	0	0	0	5	0.05
Anas ocuta	10	0.05	0	0	0	0	12	0.13
Anas penelope	0	0	0	0	0	0	0	0
Anas crecca	1234	5.83	125	9.10	0	0	195	2.06
Tadorna tadorna	8	0.04	2	0.14	1	0.06	15	0.16
Aythya ferina	1771	8.36	24	1.74	26	1.46	210	2.22
Aythya fuligula	12	0.05	0	0	0	0	15	0.16
Aythya nyroca	186	0.87	107	7.79	185	10.4	261	275
Aythya spp	0	0	0	0	0	0	0	0
Oxyura leucocephala	10	0.04	2	0.14	0	0	31	0.33
Anser anser	3	0.01	0	0	0	0	0	0
Sterna anaethetus	0	0	0	0	0	0	0	0
Podiceps cristatus	0	0	0	0	0	0	0	0
Tachybaptus ruficollis	178	0.84	38	2.76	62	3.48	243	2.56
Podiceps nigricollis	138	0.65	17	1.23	55	3.09	272	2.87
Phoenicopterus ruber	3	0.01	3	0.218	1	0.06	26	0.27
Podiceps nigricollis	0	0	0	0	0	0	0	0
Larus ridibundus	3590	16.96	69	5.025	85	4.77	129	1.36
Larus michahellis	6274	29.64	37	2.69	67	3.76	93	0.98
Larus fuscus	57	0.26	2	0.14	2	0.11	7	0.07
Larus delawarensis	0	0	0	0	0	0	0	0
Ardea cinerea	98	0.46	45	3.27	25	1.4	120	1.27
Nycticorax nycticorax	8	0.03	10	0.72	4	0.22	0	0
Bubulcus ibis	79	0.37	47	3.42	44	2.47	80	0.84
Ardea purpurea	0	0	0	0	0	0	0	0
Egretta garzetta	2	0.58	10	0.72	12	0.67	24	0.25
Ardea aigretta	1	0.01	0	0	0	0	7	0.07
Plegadis falcinellus	2	0.01	12	0.87	14	0.36	35	0.37
Phalacrocorax carbo	0	0	0	0	0	0	6	0.06
Ciconia ciconia	0	0	0	0	0	0	0	0
Fulica atra	1897	8.96	420	30.58	640	35.9	2190	23.1
Gallinula chloropus	297	1.40	165	12.01	295	16.6	295	3.11
Porphyrio porphyrio	1	0.01	0	0	0	0	0	0
Porzana porzana	0	0	0	0	0	0	0	0
Glareola pratincola	0	0	0	0	0	0	0	0
Himent. himantopus	0	0	0	0	0	0	0	0
Recurvirostra avosetta	0	0	3	0.21	0	0	0	0
Gallinago gallinago	40	0.18	13	0.94	5	0.28	47	0.5
Calidris alba	15	0.07	0	0	0	0	8	0.08
Tringa ochropus	10	0.05	0	0	8	0.45	43	0.45
Actitis hypoleucos	0	0	0	0	0	0	6	0.06

Table 2 : Contd.,

Tringa totanus	0	0	0	0	0	0	0	0
Limosa limosa	0	0	0	0	0	0	0	0
Charadrius dubius	12	0.06	9	1.57	28	0.24	23	0.24
Charadrius hiaticula	0	0	0	0	0	0	41	0.43
Charadrius alexandrinus	14	0.07	0	0	3	0.17	11	0.12
Charadrius alexandrinus	0	0	0	0	0	0	8	0.08
Vanellus vanellus	0	0	0	0	0	0	4	0.04
Circus aeruginosus	5	0.02	5	0.36	2	0.11	4	0.04
R	51							
N	21164	100	1373	100	1781	100	9479	100

WI 8: Winter **2008; SP8: Spring 2008; ET8: Summer 2008; Aut 8: Autumn 2008**

%: Relative abundance

N: Number

R: Richess

Table 3: Diversity, Abundance of Water Bird in the Lake of Réghaia in 2009

	2009							
Species	**win**	**%**	**spr**	**%**	**sum**	**%**	**aut**	**%**
Anas platyrhynchos	600	4.58	413	25.12	159	3,14	546	5.65
Anas clypeata	2979	22.74	25	1.52	36	0.71	2127	22.15
Anas strepera	80	0.61	3	0.18	0	0	2673	27.84
Anas ocuta	4	0.03	0	0	0	0	12	0.12
Anas penelope	6	0.04	0	0	0	0	12	0.12
Anas crecca	1276	9.74	0	0	0	0	384	0.25
Marmaronetta angustirostris	4	0.03	0	0	0	0	0	0
Tadorna tadorna	20	0.15	1	0.06	0	0	24	0.24
Aythya ferina	736	5.61	20	1.21	71	1.40	24	0.25
Aythya fuligula	17	0.12	0	0	4	0,07	0	0
Aythya nyroca	68	0.51	106	6.44	104	2.05	204	2.12
Aythya spp	0	0	0	0	0	0	204	2.12
Oxyura leucocephala	2	0.01	1	0.06	1	0.01	27	0.28
cristatus	0	0	25	1.52	25	0.49	27	0.28
Sterna anaethetus	0	0	0	0	10	0,19	0	0
Podiceps cristatus	3	0.02	0	0	12	0.23	26	0.27
Tachybaptus ruficollis	51	0.38	11	0.66	192	3.79	26	0.27
Podiceps nigricollis	42	0.32	10	0.60	23	0.45	46	0.48
Phoenicopterus ruber	5	0.03	0	0	0	0	16	0.17
Podiceps nigricollis	0	0	1	0.06	0	0	62	0.65
Larus ridibundus	2116	16.15	59	3.58	2209	43.65	1500	15.62
Ichthyaetus melanocephalus	0	0	0	0	658	13.01	95	0.99
Larus michahellis	1791	13.67	73	4.44	32	0.63	141	1.46
Larus fuscus	104	0.79	15	0.91	19	0.37	22	0.23
Larus delawarensis	0	0	0	0	0	0	6	0.06
Ardea cinerea	92	0.70	8	0.49	0	0	106	1.26
Nycticorax nycticorax	3	0.02	15	0.91	0	0	9	0.09
Bubulcus ibis	35	0.27	11	0.67	1	0.01	42	0.43

Table 3 : Contd.,

Ardea purpurea	1	0.08	0	0	4	0.07	51	0.53
Egretta garzetta	1	0.01	8	0.48	0	0	58	0,60
Plegadis falcinellus	6	0.05	4	0.24	3	0.05	69	0.71
Phalacrocorax carbo	8	0.06	0	0	6	0.11	16	0.16
Ciconia ciconia	0	0	1	0.06	0	0	85	0.88
Fulica atra	2404	18.35	486	29.56	552	10.91	1948	20.28
Gallinula chloropus	547	4.17	189	11.49	659	13.02	1600	16.66
Porphyrio porphyrio	3	0.02	2	0.12	1	0.02	3548	36.94
Porzana porzana	1	0.01	0	0	0	0	0	0
Glareola pratincola	0	0	4	0.24	0	0	0	0
Himent. himantopus	32	0.24	77	4.68	205	4.05	110	1.15
Gallinago gallinago	50	0.38	0	0	47	0.93	110	1.14
Calidris alba	5	0.04	0	0	0	0	0	0
Tringa ochropus	1	0.01	0	0	14	0.28	0	0
Actitis hypoleucos	1	0.01	9	0.54	2	0.04	23	
Tringa totanus	1	0.01	0	0	0	0	0	0
Limosa limosa	0	0	0	0	2	0.04	0	0
Charadrius dubius	0	0	22	1.33	1	0.01	0	0
Charadrius hiaticula	0	0	27	1.64	8	0.15	9	
Charadrius alexandrinus	0	0	17	1.03	0	0	0	0
Charadrius alexandrinus	0	0	0	0	0	0	9	0.09
Vanellus vanellus	0	0	0	0	0	0	0	0
Circus aeruginosus	5	0.03	1	0.06	0	0	5	0.05
R	39							
N	13100	100	1644	100	5060	100	9627	100

WI 9: Winter 2009; SP 9: Spring 2009; SUM 9: Summer 2009; Aut 9: Autumn 2009

%: Relative abundance

N: Number

S: Richess